

CLAIMS

WHAT IS CLAIMED IS:

1. A method for communicating Layer-3 control information in a communications network comprising the steps of:

marking packets carrying the Layer-3 control information;

encapsulating the packets at Layer-2.

2. The method of claim 1 wherein the step of marking further comprises:

marking the packets using a unique protocol identifier.

3. The method of claim 1 wherein the step of marking further comprises:

marking the packets using a link-local MPLS label.

4. The method of claim 1 further comprising the step of:

applying interface groups to determine when marking of control packets is to be done.

5. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to packet communications within a particular interface group.

6. The method of claim 5 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a backbone interface group.

7. The method of claim 5 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a customer-specific interface group.

8. The method of claim 5 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a peer interface group.

9. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to packet communications between interface groups.

10. The method of claim 9 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between backbone and customer-specific

interface groups.

11. The method of claim 9 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between customer-specific and peer interface groups.

12. The method of claim 9 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between backbone and peer interface groups.

13. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of ICMP packets.

14. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of ping packets.

15. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of traceroute packets.

16. The method of claim 4 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of packets from Network Operations Center (NOC) hosts.

17. The method of claim 1 wherein the step of encapsulating the packets further comprises:

encapsulating the packets according to control encapsulation.

18. The method of claim 1 further comprising:

receiving unmarked control packets using rate-limited queues.

19. The method of claim 1 further comprising:

receiving the packets as received packets; and

processing the received packets at a line rate.

20. Apparatus for communicating Layer-3 control information in a communications network comprising a network element adapted to perform the steps of:

marking packets carrying the Layer-3 control information;

encapsulating the packets at Layer-2.

21. The apparatus of claim 20 wherein the step of marking further comprises:

marking the packets using a unique protocol identifier.

22. The apparatus of claim 20 wherein the step of marking further comprises:

marking the packets using a link-local MPLS label.

23. The apparatus of claim 20 wherein the network element is further adapted to perform the step of:

applying interface groups to determine when marking of control packets is to be done.

24. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to packet communications within a particular interface group.

25. The apparatus of claim 24 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a backbone interface group.

26. The apparatus of claim 24 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a customer-specific interface group.

27. The apparatus of claim 24 wherein the step of applying interface groups to packet communications within a particular interface group further comprises the step of:

applying interface groups to packet communications within a peer interface group.

28. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to packet communications between interface groups.

29. The apparatus of claim 28 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between backbone and customer-specific interface groups.

30. The apparatus of claim 28 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between customer-specific and peer interface groups.

31. The apparatus of claim 28 wherein the step of applying interface groups to packet communications between interface groups further comprises the step of:

applying interface groups to packet communications between backbone and peer interface groups.

32. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of ICMP packets.

33. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of ping packets.

34. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of traceroute packets.

35. The apparatus of claim 23 wherein the step of applying interface groups further comprises the step of:

applying interface groups to communication of packets from Network Operations Center (NOC) hosts.

36. The apparatus of claim 20 wherein network element is further adapted to encapsulate the packets according to control encapsulation.

37. The method of claim 20 wherein the network element is further adapted to receive unmarked control packets using rate-limited queues.

38. The apparatus of claim 20 wherein the network element is further adapted to receive the packets as received packets and to process the received packets at a line rate.